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Journal of the Society of Arts.

FRIDAY, OCTOBER 23, 1868.

Announcements by the Council.

EXAMINATIONS, 1869.

The Programme of Examinations for 1869 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

PRIZES.

The Council, at the suggestion of the Food Committee, offer the following prizes for Improved Railway Meat Vans, Milk Vans, and Milk Cans :—

1. For an improved method of conveying meat by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which meat now suffers in its transit by rail. The principal evils to be avoided are—excessive changes of temperature, and injuries by pressure, by handling, exposure to dust, insects, &c. This prize may be awarded for an improved railway meat van or for a travelling meat larder suitable for railways.

Model on a scale of half an inch to a foot to be sent in.

2. For an improved method of conveying milk cans by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary open trucks. The principal evils to be avoided are—the heating and shaking of the milk cans.

Model of an improved railway milk van, on a scale of half an inch to the foot, to be sent in.

3. For an improved railway milk can, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary milk cans, or "churns." The principal evils to be avoided are—the heating of the milk, and all motion within the can which may cause the buttery particles to separate.

A specimen of the improved railway milk-can to be sent in.

The models and specimens for competition must be forwarded to the Secretary of the Society of Arts before the 1st February, 1869.

SUBSCRIPTIONS.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of Institutions.

SOUTHAMPTON HARTLEY INSTITUTION.—Dr. Bond, the principal of the Institution, a few days since, delivered the first lecture of a course on "Experimental Physics," adapted for young persons. The greater part of the

audience on the occasion consisted of about 200 boys, who had been selected from the national and other similar schools in the neighbourhood, and who, with their teachers, will be admitted gratuitously to the course. The object which Dr. Bond has in view in making this experiment, which has grown out of a conference with the teachers held a short time ago in the Institution, is two-fold; firstly, to prepare a certain number of the boys for the examinations of the Department of Science and Art, and for competition for the Local Science Exhibition, which has lately been founded by the council of the Institution, in conjunction with the Committee of Council, for artisans in Southampton; and, secondly, to lay the foundation of a regular system of science teaching in the national schools of this neighbourhood. It is hoped that this will be effected by the opportunity which the masters will have of qualifying themselves, by attending the course, for obtaining the science certificates of the Department of Science and Art, and thus earning payment for themselves on results. In making the proposal to the teachers to establish this class, Dr. Bond offered to hand over to them all payments which might be made to him by the Department of Science and Art, on account of boys attending the class who might take certificates at the examinations of the department, on condition that the teachers would undertake to supplement the work of the lecturer, by preparing the boys in school for the examination, thus giving the teachers a direct personal interest in the work of the class.

YORKSHIRE UNION OF MECHANICS' INSTITUTES.—*Shelley Mechanics' Institution.*—On Saturday, October 17th, the members and friends of this Institution met in the Assembly Rooms, to hear the opening address of the winter session, by Mr. Henry H. Sales, on the work of Mechanics' Institutes, with special reference to the examinations of the Society of Arts. The President occupied the chair, and at the close of the address presented the thanks of the meeting to Mr. Sales.

EXAMINATION PAPERS, 1868.

(Continued from page 793.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

SPANISH.

THREE HOURS ALLOWED.

Candidates for the first-class are to translate an English passage into Spanish, to render in English several proverbs and idiomatic phrases, and to write in Spanish a short essay.

Translate into Spanish:—

Sancho came up to his master so faint and so dispirited, that he was not able to urge his ass forward. Don Quixote, perceiving him in that condition, said, "Honest Sancho, that castle or inn, I am convinced, is enchanted, for they who so cruelly sported with thee, what could they be but phantoms and inhabitants of another world? I am confirmed in that, for, having found that when I stood at the pales of the yard, beholding the acts of your sad tragedy, I could not possibly get over them, not even alight from Rocinante, so that they must certainly have held me enchanted, for I swear to you, by the faith of what I am, that, if I should have got over, or alighted, I would have avenged you in such a manner as would have made those poltroons and assassins remember the jest as long as they lived, even though I would have thereby transgressed the laws of chivalry, for, as I often have told you, they do not allow a knight to lay his hands on his sword against any one who is not so, unless it be in defence of his life and person, and in cases of extreme necessity." "And I, too," quoth Sancho, "would have revenged myself, if I had been able, knight or no knight, but I could not; though, in my opinion, they who diverted themselves with me, and at my expense, were not hobgoblins, but men of flesh and

bones as we are, and each of them, as I heard while they were tossing me, had his proper name. One was called Pedro Martinez, another Tenorio Fernandez, and the landlord's name is John Polomeque, the left-handed: so that, sir, as to your not having been able to leap over the pales, nor to alight from your horse, the fault lay not in the enchantment, but in something else. And what I gather clearly from all this is that these adventures we are in quest of will, in the long run, bring us into so many misadventures that we shall not know which is our right foot; so that, in my poor opinion, the better and surer way would be to return to our village, now it is reaping time, and look after our business, nor go rambling from Ceca to Meca, and out of the frying-pan into the fire."

Don Quixote, translated by Jarvis, cap. xviii.

Translate into English:—

PROVERBS AND IDIOMATICAL EXPRESSIONS.

1. Ahora que te veo, me alcuero.
2. No hay caballo, por bueno que sea, que no tropiece.
3. Perro ladrador no es mordedor.
4. No es razonable andar á caza de gangas.
5. Si quieres no errar, cosete la boca.
6. Su padre le calentó las orejas.
7. Mi amigo está en candelería.
8. No hay mas cera que la que arde.
9. Nos dió con las puertas en los ojos.

Write a short essay on any subject in Spanish.

Candidates for the second-class certificate will have to translate the half of the preceding extract, five of the idiomatical expressions, and the two next chistes.

Al ir un general á dar una batalla á los persas, le dijo un soldado medioso, mi general, es preciso ir con cautela con los persas, porque son tan numerosos sus ejereitos que con sus flechas cubren el sol. Tanto mejor replicó el general así pelcarémos á la sombra.

Preguntando uno á un viagero, ¿si sabia cual era la mejor cosa? respondió: la libertad. ¿I la mas gustosa? la ganancia. ¿I la mas conocida? la fortuna. ¿I la peor? la muerte. ¿I el mas dichoso del mundo? el hombre sabio, rico y con salud. ¿I el mas desgraciado? el anciano sin bienes. ¿I el mas importuno? el hablador. ¿I el mas peligroso? el medico ignorante. ¿I el mas digno de compasion? el mentiroso que no es creido, cuando dice verdad.

Candidates for the third-class certificate will have to translate into English the next extract from *Gil Blas*, and translate into Spanish some phrases for the elucidation of irregular verbs and other grammatical rules.

Translate into English:—

Sirviéronme un copioso plato de manos de carnero fritas y lo comí casi todo: bebí á proporción, y despues fui a la cama. Era esta muy buena, y esperaba que luego se apoderaría de mis sentidos un profundo sueño, pero engañéme, porque apenas pudo cerrar los ojos, ocupada la imaginación en que genero de vestido había de escoger. ¿Que haré? me decía, ¿seguiré mi primer impulso de comprar unos habitos largos para ser domine en Salamea? Pero ¿á que fin vestirme de estudiante? ¿Tengo yo deseos de consagrarme al estado eclesiástico? ¿Acaso me inclina á ello me propension? Nada de eso: mis inclinaciones son muy contrarias á la santidad que piden: quiero ceñir espada, y ver de hacer fortuna en el mundo I á esto me decidí.

Resolví, pues, vestirme de caballero bien persuadido de que esto bastaría para alcanzar un empleo de importancia. Con tan lisonjeros proyectos estuve esperando el dia con grandísima paciencia, y apenas rayó en mis ojos la primera luz, cuando salté de la cama. Illice tanto ruido en el mesón que despertaron todos. Llamé á los criados que estaban todavía en la cama, y me respondieron echandome mil maldiciones. Al fin se vieron obligados a levantarse y les di orden de que fuésen á buscar el prendero. No tardó mucho en llegar este con dos mozos cargados, cada uno con un envoltorio Saludome con

grandes cumplidos y me dijo, Caballero, ha hecho bien y V ha tenido gran fortuna en dirigirse á mí mas bien que á otro; no quiero desacreditar mis compañeros; mas aquí para nosotros dos, ninguno de ellos sabe lo que es conciencia: todos mas duros que judíos; yo soy el unico de mi oficio que la tiene; me limito á una ganancia justa y razonable, contentandome con un real por cada cuarto, equivoquéme quise decir con un cuarto por real. Despues de este preambulo, que yo creí al pie de la letra, mandó los mozos que desatasen los envoltorios.

Gil Blas, cap. xiv.

Translate into Spanish:—

1. They loved each other, and their fondness increased with time.
2. You must depart immediately; there is not a moment to lose.
3. She likes this bonnet, but does not like the other at all.
4. Forty-five houses in the village.
5. A city with two hundred and thirty-six thousand souls.
6. Eighty-four chapters in the first volume, and nearly a thousand pages.
7. A score of people in the theatre.

FREE-HAND DRAWING.

THREE HOURS ALLOWED.

Candidates are not required to attempt all the following subjects.

1. Make a drawing of the bird or birds, either in the cage or out of the cage.
2. Make an outline of the perambulator.
3. Draw from memory either a human head, or some foliage of a tree, or a tombstone.
4. State what you know of the proportions of the human figure. [Every candidate is expected to reply to this question; and if he does not know anything of the proportions of the figure he must say so.]

DIRECTIONS FOR THE LOCAL BOARD.

Place a cage or coop, containing birds or fowls, before the candidates in free-hand drawing. The bottom of the cage or coop to be between three and four feet from the ground.

Put a perambulator or child's carriage on a table.

(To be continued.)

HARVESTING CORN IN WET WEATHER.

PRIZE ESSAY.

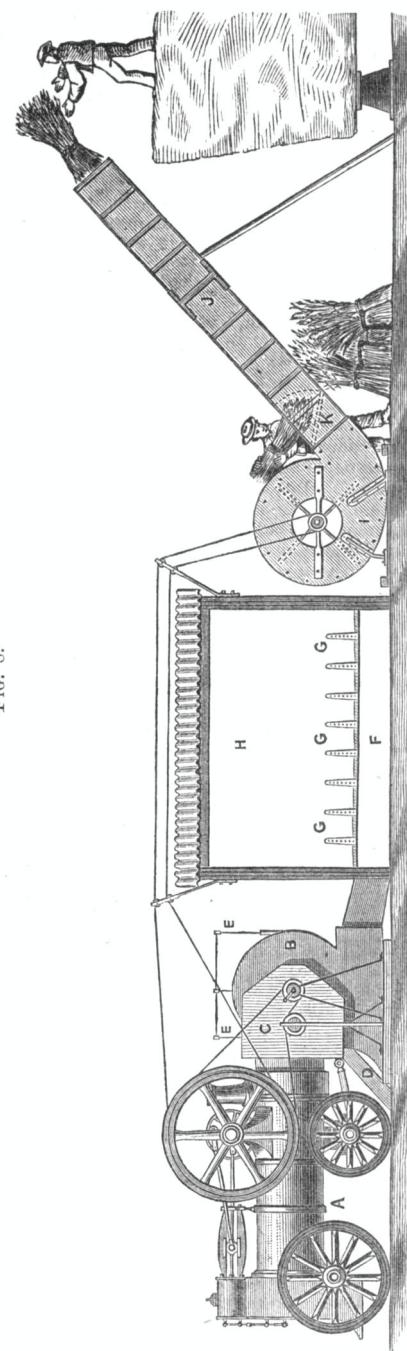
By W. A. GIBBS, Esq., of GILLWELL-PARK, ESSEX.

(Concluded from page 796.)

In the first arrangement of a model fan, so as to work it by a portable engine, I took some pains in calculating the respective apertures in the hollow shell or iron casing; "cone-ing" down from the opened back-plate of the engine with much nicety of adjustment, a funnel-shaped air channel to connect the smoke-box with the fan-case, and adapting the screen of malting wire at the larger end of this cone, so as not to check the draught by its intervening mesh-wires. Of course it was impossible to foresee what would be the first effects of this novel mode of dispensing with the steam blast and chimney stalk, or whether we should get steam enough, or more than we could manage. It was, therefore, a great relief to me to find that we had the most perfect and easy command of the draught of the furnace and the generation of steam. Turning the fanners by hand for a short time after lighting the fire, got "steam up" in half the time that it usually takes with the ordinary chimney draught, and then, when once up, by regulating the bulk of the fuel and the quantity of air admitted by the doors we could keep it quietly jogging on at 3 lbs. or 5 lbs. per

inch pressure, or run it up to 30 lbs. or 40 lbs. at need. In order to assure myself of the small power required to drive the fan, I preferred to work nearly the whole of the experiments using only 5 lbs. pressure; and this gave a fairly uniform temperature of 320° for the fan whilst the furnace door was closed, and 220° when opened. Here, therefore, was a fair ground for supposing that, by increasing the velocity and volume of such heated air, we should be enabled to deal with larger quantities of hay or wheat. Hence the next steps to take were the calculation for, and construction of, a fan of a size commensurate with the power of the engine and the bulk of the crop. In planning out the proportions for this, I desired to make it as large as possible, short of being utterly huge and unwieldy, because, by having ample size, the volume of air could be regulated by the velocity of revolution. This shape and proportion was, however, in a great measure to be determined by the breadth between the driving-wheels of the usual portable engine, and the height from the ground and circumference of the opening of its smoke-box; a minor and yet important consideration was how best to "work-in" in the construction the common and easily obtainable sizes of iron plates. These varied conditions were at last fulfilled by making the fan 6 feet high, 4 feet 6 in. diameter in the circular part, and 2 feet 6 in. wide, with side chambers and back casing duly proportioned to the mouth or outlet. Before definitely commencing to build up this monster fan I found it very useful to model all its different parts to scale, and I would strongly advise all amateur engineers to devote plenty of time and patience to this part of their devices. Whilst this was in course of construction we still carried out at intervals various tentative trials with the engine and small fan. In one of these experiments 28 lbs. of dried hay was slowly watered with the best imitation of heavy rain that we could improvise, 23 lbs. of water being thus administered to it, but when it was again weighed it had only increased to 42 lbs., having thus retained 14 lbs. out of the 23 lbs., *i.e.*, equal to one-third of the original weight of the hay; this wetted hay, being then subjected to the air blast at 320° , dried in nine minutes, weighing then only 21 lbs. This was the third or fourth proof of the loss sustained, when hay is rained upon and has to be again dried; and it also seemed to show that when the sap and natural moisture of the grass is once thoroughly out of it, it does not re-absorb, or even mechanically hold, any such large proportion of water as to render artificial drying or finishing a very formidable operation. The wheat at this time was not sufficiently ripe to try any experiments with it, but we took 36 lbs. of wheat straw—the dampest and mouldiest that we could get, and watered this plentifully, until it weighed 56 lbs., and then dried it in thirteen minutes, after which it weighed only 31 lbs. About half a pint of corn was shaken out of this truss of straw by the operation, although it had been threshed by one of the best machines in the country. This circumstance is worth notice, as showing that thorough dryness would increase the yield of corn from the straw. Half a pint more corn from each 36 lbs. of straw, small as it sounds, would mean an extra bushel per acre, which would help to pay for a good deal of extra coke. Touching the consumption of this last, we found that working the engine at from 5 lbs. to 10 lbs. pressure, 1 cwt. of coke gave both power and heat enough for carrying on the work during six hours.

The large fan being at length completed and fixed on to a rough frame-work of deal boards, we found that four men could lift it into, and out of, a farm-cart with very little trouble. We had formed the large central opening in the back casing, to stand exactly level with, and correspondent to, the opening of the smoke-box of the engine; it was, therefore, easily and quickly adjusted to this, without any nice fittings or intermediate chamber; a diaphragm of malting wire being fastened on to this opening, the fan was merely "butted up" to the end of



A—Engine. B—Hot-blast fan. C—Casing of fan through which the heat from the engine is drawn. D—Air-duct from a sunk furnace (not shown). E E—Valve rods to regulate the supply of hot or cold air. F—Space between the ground and iron floor. G G G—Perforated conical tubes up which the hot air from F rises into the centres of the sheaves. H—Iron wheat house with its side walls and doors removed to show the tubes: this house is divided into two compartments by an iron partition down its centre, and the mouth of the hot-blast is provided with a valve by which the air can be directed into either compartment alternately. I—Cold-blast fan. J—Elevator. K—Valve for the introduction of corn sheaves or dried hay.

the engine, and steadied in its place by a few wooden stakes driven into the ground. A driving-band from the smaller wheel of the engine carried to the 7-inch pulley on the spindle of the fan gave us about 600 revolutions per minute, and produced, even at that slow speed, a tolerably good imitation of a sirocco. In order to utilize the waste steam from the engine (now no longer needed as a promoter of combustion), I had had made a **C** shaped vessel, six feet long and four feet broad, with a steam-way between the double plates of which it was formed. This, when laid on the ground with its open end to the mouth of the blower, stood two feet high, and served as a convenient receptacle for the hay, presenting a large surface heated by steam, which communicated that heat to whatever was placed in contact with it, and thus aided the drying action of the blast. This hot chamber or receiver I intend to place upon a single pair of low wheels, and adjust shafts to it, as by these additions it will form a strong and convenient low cart on which the fan can be carried about from one place to another; an old shed anywhere in the fields or the steading will give shelter enough to carry on the process, or an additional rick cloth could be set up in the middle of the field, if thought desirable, and the hay brought from all points to this, as a centre, to be there dried, and carted home when thus finished. This arrangement might have some advantages when the rick-yard is a long distance from the field, but otherwise the plan I should prefer would be to make use of some building near enough to the stack to enable the men to fork the hay or wheat forward as it dried, into the "atmospheric hoist," and let it be blown up at once from the ground on to the top of the stack.

It was whilst waiting for rain to wet a quantity of hay so as to put the drying apparatus to the test on the large scale, that I found leisure to prove that the blast principle may be made to serve the purpose of a hay and straw elevator. The apparatus now in use for this special work is effective, but it is costly and somewhat cumbersome, and cannot, I believe, be worked at all during rain; so I brought the old fan into use again for a new purpose. We first adjusted it in such a position as that a strap from the larger wheel of the engine would run on the rigger of the spindle; and then wedged up the fan until the mouth stood at an angle of 45 degrees, pointing up to the top of the stack; as a continuation of that mouth, a box 20 feet long, 18 inches broad, and six inches deep, open at both ends, was constructed and lifted on to it, the upper end resting on a loading platform; a hinged valve being made at the lower end of this box, at a convenient height for feeding-in. The power of the blast drove up the hay and straw so well and quickly, that I felt justified in at once constructing a full-sized apparatus upon this principle. Before this was finished heavy rains came down upon a quantity of half-made hay, and gave me the requisite conditions for a definite experiment in drying, by which it was proved that a two-horse load of thoroughly wetted hay could be dried in one hour. By taking a rough average calculation of two such loads per acre, this indicates that in a working summer day of 12 or 14 hours, a farmer would be enabled to clear six or seven acres, or if he adopted the plan of dividing his men into two gangs during the wet weather, so as to carry on the work through the cool hours of a summer night, he might clear, dry, and stack the produce of 10 to 12 acres in the 24 hours. If practical men do not, upon consideration, feel content with such quantities, I have every reason to believe that I may safely promise them the power of dealing with twice or three times as much, by merely increasing the velocity from 600 to 1,200, or 1,800 revolutions per minute, because it will be readily granted that increased volume of hot dry air will give a proportionately increased evaporation. If the demand is still for more work, it can be answered by putting on more fans to the same engine. One 8-horse engine would drive four or five of these with ease, and more heat could be supplied, if needed, by connecting

with the casings of the fans any simple form of portable stove. It would therefore appear that this method is practically unlimited in the extent to which it may be applied; and the advantage of this principle of extension will be felt to be more important when we come to deal with wheat, and the infinite variety of grain crops. To wheat, I now devoted my chief attention for the whole remaining part of this season. I had not much expectation that the same arrangement which had sufficed for hay drying, would serve also for the grain crops, but it was worth trying, so we opened some wet sheaves, and handling them as gently as possible, subjected them to the action of the hot blast in the steam receiver; but, as will be easily anticipated, even the most careful and gentle movement (so careful, indeed, as scarcely to fulfil the requisite conditions of exposing each part in turn to the action of the hot air), caused a notable quantity of the seed to fall out, and decidedly injured the straw. We next tried to dry the sheaves without unbinding, by placing them in every conceivable position, and endeavouring to direct the hot air through and amongst them; but this was a total failure—the exterior dried to brittleness, and the interior of each sheaf (especially under the band) remained as wet as ever. After reconsidering and rejecting many mechanical movements it seemed that the best and simplest thing to try next was a portable shed, in which the hot air could be retained long enough to diffuse itself through the sheaves. This, therefore, I planned and constructed with all speed, framing thin plates of iron on rough wooden battens, so as to form a number of panels, each panel being two feet broad by six feet high. A shed formed in this way is capable of indefinite increase either in length or breadth simply by bolting together a greater or less number of such panels, to form its sides and ends. The size fixed upon for this first trial was 12 feet square; and in order to form a foundation for the shed, four 12 feet planks were made into a square, shallow box, standing one foot deep upon the ground; a fifth plank, laid down the middle, divided this foundation into two compartments; at one end of this middle plank a valve was so arranged that the hot air, as it came in from the mouth of the fan, could be directed at pleasure to one or other of these compartments; the panels were then set up on the outer square of planks, and a corresponding division to the one below carried up to the roof of the shed, so as to divide it into two compartments of 6 feet by 12; two panels on each side of the shed were hinged, so as to give separate access to each compartment, and, finally, a false floor of wire-net was laid on the edges of the planks to sustain the wheat-sheaves at a height of twelve inches from the ground. The fan and engine being then adjusted to this shed, the air from the latter could be driven in under this false floor. Wet sheaves were now placed in one compartment, and the trial commenced. It was again an utter failure. The exterior of each sheaf was dried to brittleness long before the centres were anything like dry enough. We tried again, packing them as closely as possible in the shed, but with no better success, the close packing only heading-back the air, and retarding the process. So the wires were taken up and replaced by a plate-iron floor, into which a number of conical tubes had been riveted, in such a manner as to stand up about 18 inches from the level of the plates. These tubes served as air conduits, and, when sheaves of wheat were spiked upon them, guided the hot air into the very centre of each sheaf; small holes were made in the tubes to allow a proportion of the hot air to pass through the lower parts of the sheaves, and this had the desired effect of drying both corn and straw evenly and sufficiently. The first systematic experiment was upon a load of wheat, which the farmer from whom I procured it considered to require three days more drying before being fit to cart; it was decidedly moist to the touch, and there was some admixture of grass and green weed bound in with it. We took 32 of the sheaves, laid them

down singly on the ground, watered them with about 60 or 70 gallons of water, and then spiked them on to the tubes in one compartment of the shed ; the fan being driven at about 500 revolutions per minute, sent in air which marked a temperature of 280° as it passed the mouth of the fan, but which came off from the spaces under the roof at 140° . In twenty minutes all these sheaves were examined, and pronounced, by the practical farmers who were present, to be dry enough for threshing out the corn, and for stacking the straw. Whilst these were drying, the second compartment was charged with another lot of 32 wetted sheaves, and by increasing the temperature of the ingoing air to 320° , and slightly accelerating the speed of the fan, these were equally well dried in fifteen minutes. The pressure on the safety-valve during this work did not exceed 10lbs. to the inch, and the bulk of fuel in the furnace was kept down to half its usual charge; the draught did not appear to be stronger than that usually produced by the blast-pipe.

About a week after these trials, the weather afforded an opportunity for a still more decisive experiment, and I was enabled to obtain a load of wheat, in the straw, which had been exposed first to eighteen hours of heavy, constant rain; had then had a day's standing in the field; then another six hours' rain and another day's standing, and was finally carted up to the drying shed during a perfect deluge of thunder-rain, which so completely drenched it, that the water ran from the sheaves as they lay in the cart; this was brought up in the morning about twelve o'clock, and left exposed to heavy showers till four o'clock in the afternoon, notwithstanding which, by using a temperature of 340° , and a velocity of about 700 revolutions per minute, several charges, of 32 sheaves each, were dried in fifteen minutes; the pressure was allowed to range up to 14lbs. to the inch, but the bulk of fuel in the furnace was not increased. It was objected that the quantity thus capable of being dealt with in a day would be too small; but it will be easy to see that the same fan, at double or treble the number of revolutions, would deal with twice or thrice the quantity, and the shed could be doubled or trebled in capacity without any difficulty. The bulk of incandescent fuel could also be doubled if it were found needful, and the waste steam from the engine utilised by means of pipes, or a hollow division between the two compartments. If, therefore, a shed of double the capacity of this present one is adopted, viz., 12ft. by 24ft., this would enable a farmer to dry sixty-four sheaves in fifteen minutes = 256 per hour. Now, by average obtained from three farms in this neighbourhood, 256 sheaves represent the produce of rather more than half an acre, hence half an acre per hour, or twelve acres in the twenty-four hours could be cleared by this means. If we take an average farm, say of 1,000 acres, worked upon the four-course system, there would be probably 250 acres in wheat, and upon the supposition of a season so unfavourable that the whole produce of those 250 acres had to be finished and harvested by artificial means, this could be practically accomplished in 21 days. On larger farms, or where a larger proportion of grain was cultivated, a larger drying shed would probably be advantageous.

I do not think any corn farmer need grudge the cost of fitting up a brick shed, or the erection of an iron one, with this false floor and tubes, because if attention be given for a few minutes to the peculiarity of this construction, it will be seen to be well adapted to the purpose of a storehouse for grain when its first office of a drying-room is accomplished. Being brick and iron, or all iron, it is impervious alike to damp or vermin; and having an air space between the false floor and the ground, and tubes which can be lengthened or capped, so as to diffuse air equably and freely into all parts of the mass of grain, it possesses many advantages over the ordinary form of granary; especially the facility of driving in, at any time of need, a current

of warm air by means of the fan, which for this purpose might be driven by hand, and obtain its heat from a small portable stove adjusted to its casing. During the experiments it was questioned as to how far the high temperature used in the drying might affect the germination of the seed, but inasmuch as the moisture in the straw and grain instantly reduces the heat of the air which comes in contact with it, it was hardly maintained as a possible objection; however, to put the question beyond all doubt, I had five several plots sown with the wheat thus dried, and at this present time they are all up, and as well forward as any wheat in this neighbourhood.*

It was a matter of surprise to many who were present that the grain, when rubbed out, was wholly free from burnt taint or smell. This is explained by the fact that the gaseous products of combustion, being by nature volatile and evanescent, pass away in the steam which they generate; even were it not so, the husk envelops the grain so completely as to protect it from all direct action. An opinion was expressed that the dilute sulphurous acid gas given off by malting coal or coke would have the effect of checking or destroying any insect-life that might be latent or developed in the wheat, and thus secure it from after deterioration when stored; and that opinion seems largely confirmed by the well known value of sulphurous fumigation in hop-drying and vine culture.

I come now to the question of cost. This must, of course, be to some extent modified by the relative condition of wetness or dryness of the crops to be dealt with; but there are certain fixed data which may be ascertained with a fair amount of accuracy. First, as to the engine. If a farmer possesses one it will probably have cost him £200, and may be expected to last about twenty years, and then to be worth about £50; this £150 divided over twenty years makes a first charge of £7 10s. per annum for money sunk in the purchase; the interest on £200, at 5 per cent., shows £10, and the repairs will average another £5, making a total annual cost of £22 10s., *i.e.*, about 1s. 6d. per diem. The next item is the hot blast; if we take the first cost of this at £35, and estimate it to last 35 years (as with its short time of work and simplicity of construction it assuredly would), that gives £1 per annum for money sunk; 5 per cent. on £35 gives £1 15s. for interest, and 17s. per year would cover any repairs that might be needed; this forms a total of £3 12s. per annum. This hot blast, when once established on the farm, will, I think, be found available for a great many purposes, but for the present calculation we will put the whole charge upon the six weeks of harvest; this, therefore, will be another 2s. per diem. The new shed, or the tubular flooring fitted to an existing building, must not be estimated as machinery; neither must its whole cost be debited to the drying process, because it serves also the purpose of a storehouse or granary; therefore, if we take such a shed (say of 24 feet \times 12), with its tube floor and divisions, to have cost, in one way or another, £80, a 7½ per cent., calculated on the six weeks during which it is devoted to this drying process, is all that is fairly chargeable to that account; this would show 15s., but we will call it 18s., so as to make an even sum of 6d. per diem. By bringing down these three calculations we arrive at a daily charge, for machinery and shed, of 1s. 6d. + 2s. + 6d. = 4s.

We have next to consider the labour cost.

One man is able, without hurrying himself, to fork on to the tubes 64 sheaves in 8 minutes, and to take them off in rather less time; hence he could empty or fill one compartment of the shed while the other half was drying. The carter who brings the wheat in from the field could of course keep pace with him by forking down the sheaves from the cart; thus we must estimate two men for day and two for night, equal to four labourers at 3s.

= 12s. The extra cartage, by reason of the additional weight of water in the wheat, depends upon the distance of the field from the rick-yard, and the proportion of water still remaining in the crop; but, except in cases of very long distances and excessive saturation, I am assured by practical farmers that the average extra cost of this item could not exceed 10s. per diem, say 10s. There would also be required two engine men, one for night and one for day, whose wages we may set at 5s. each = 10s.; giving a total of £1 12s. If now we add these labour items to the machinery cost, we obtain 32s. and 4s. as a fixed charge for the artificial drying of the average produce of twelve acres; the sum will therefore stand at 36s., divided by twelve acres, equal to 3s. per acre.

We may now pass to the calculation for fuel, and as this must be governed wholly by the quantity of water required to be expelled, we shall have to take a range of three or four different degrees of wetness, and estimate the quantities of fuel which would be respectively needed in each case. As a starting point for these calculations, I will premise that, having recently, with a very imperfect arrangement, evaporated 7 lbs. of water from the leaves and roots of mangold with 1 lb. of coke, I think we may fairly assume, that with a perfected apparatus, in regular work, we should be able to drive off 8 cwt. by 1 cwt., especially when it is noted that hay or straw does not hold water with so much tenacity as roots or leaves. The cost of coke this year at the gas-works was 9s. per chaldron of 14 cwt. (I have purchased it in former years at 6s.); add to that 9s., 5s. more for cartage to the farm, and that will give us 1s. per cwt. as the top cost of fuel on the spot. Therefore, if the produce of an acre of hay or corn (be it a large or small yield) contains 8 cwt. of water requiring to be expelled before that produce can be stacked, the fuel-cost of expelling it would be 1s. per acre; if it contains 16 cwt. the cost would be 2s. per acre; if 32 cwt. 4s.; or if, in some exceptionally wet seasons, there should be 2 tons of water obstinately clinging to every 2 or 3 tons of the crop, the fuel-cost would rise to 5s. per acre. Take this extreme case, and add to this 5s. the fixed charge of 3s. for machinery and extra labour, and we shall arrive at a final total of 8s. per acre, which, with a four-quarter yield would put 2s. per quarter on the wheat thus saved. For this extra expense, however, it should be fairly allowed that the straw as well as the wheat is secured in better condition, and the increasingly high value of that part of the crop makes this an important point in the calculation.

I would also point out that by the use of the "atmospheric hoist" for stacking the wheat as it is taken out of the shed, a large proportion of the extra manual labour incurred in the drying process would be recouped. This hoist, which I partially described in another part of the essay, and which is a very simple and inexpensive affair, proved itself able (when driven by the same engine that was working the hot blast) to send up sheaves of wheat to the top of a stack twenty-two feet high at the rate of 960 per hour. This, and most of the other experiments here described, were carried out last season in the presence of practical farmers, engineers, and men of high standing in the scientific world, and several reports, by eminent members of the press, appeared in the scientific and agricultural periodicals and other publications of the day.

After these statements of results, I have now only to submit for the consideration of practical men a few reasons in favour of this resource, and a few of the probable advantages that would follow from its wide adoption.

In the first place, it is not a mere theory, existing only on paper, or in the imagination of a sanguine inventor, but a palpable and very visible fact, that has been, and can be, put to the severest test of practical working.

2nd. It is a powerful yet inexpensive arrangement, with no complex nor delicate machinery which would

render it liable to break down, clog, or otherwise get out of order.

3rd. It is portable and easily adjusted, and adapted to most varieties of engines without requiring any alterations in them.

4th. It leaves the hay and clover, whilst drying, constantly open to the examination of the men, so that the exact requisite point of dryness may be seen and seized upon; whilst with the cereals a definite time can be established by the first batch of sheaves, after which the same time may be depended upon for producing the same results without further watching.

5th. It does not pretend to supersede nature, to set aside experience, or to change old and approved modes of harvesting, but merely adds to them a large and easily-managed power of securing, with certainty and rapidity, each crop in succession.

6th. It does not involve any new system of things, but with an apparent natural sequence "follows the (steam) plough," and in the rotation of the seasons helps to harvest the increased growth which that plough has helped to produce.

7th. It fits in most conveniently and practically with the existing mode of hiring engines, offering a good means of paying employment to their owners just at the time when they have been hitherto idle, and yet not putting the farmer to one penny of cost, if the rare chance of a fine season for every one of his crops renders him happily independent of all need of help.

8th. It would be a boon to the harvestmen, providing them with work through wet and dry, saving them the loss of wage and temptation to drink that follows when they are turned off, to lounge about the village, waiting for a change of weather; and enabling them to get through with one job of harvest work in time enough to get another elsewhere.

These seem fair reasons for recommending it to the notice of agriculturists, especially when backed by the recollection that a well-saved harvest is not the affair of a class only, but of the community. It has been asserted that in Ireland alone the money-difference between fair and foul weather, during the in-gathering, is four millions sterling. Add to this the losses in Scotland, Wales, and the western counties of England, from a wet season, and it makes up a sum that must seriously affect the whole country.

Besides saving immediate loss, this means of harvesting the cereal crops, in spite of a rainy climate, would enable the wetter portions of the kingdom to retain, perhaps to resume, the cultivation of wheat with profit, and so (in Ireland especially) check the gradual depopulation and distress consequent upon the conversion of arable into pasture.

Nothing would be more likely to give a strong stimulus to the employment of steam machinery in Ireland, Scotland, and Wales, than the fact of its being available to counteract the disadvantages of climate; and it is precisely in those countries that our agricultural mechanists would find the widest unsupplied market for their implements.

If, therefore, it be remembered that this new adjunct of the steam-engine begins its work with the first crop of hay, can next be applied to wheat, oats, barley, and the whole range of cereals, is then at hand to finish the second crop of hay, and enables us to dry the artificial grasses at any season of the year, it would seem as if it were destined, perhaps at no very distant period, to complete that perfect circle of systematic husbandry which now begins with the steam-plough and ends with the threshing-machine.

When continuous employment can once be found for the "iron horses," we may hope to see them on every considerable farm in the kingdom; first breaking up and cultivating the soil; next, mowing, reaping, and gathering the produce; and, finally, passing from field to field, and from farm to farm, saving, drying, and bearing home the harvest.

ON THE MANUFACTURE OF SUGAR BY THE
PROCESS OF DRYING THE CANE.

BY THE HON. HENRY STUART MITCHELL, M.D., PH.D.

The following paper was read before the Scientific Association of Trinidad:—

Although borrowed from even the earliest stage of the beetroot under the consulate, it was not till 1843 that the operation of slicing was applied to the sugar-cane. It was hoped that the cane, after having been sliced and dried and ground into powder, might be preserved long enough unchanged in this condition to allow of its being transported to Europe, where, not merely the whole sugar might be extracted at once in its present form, but the ligneous portion would furnish an inexhaustible supply of fibre for the paper market. The intercolonial tonnage also would thereby have been necessarily doubled. These hopes were, however, doomed to disappointment. The dried cane powder became altered on the voyage, and not only did great part of the sugar disappear, but the changes consequent on its decomposition discoloured the residuary fibre. But there was one result from this trial sufficiently noteworthy. It was clear that the cane could be sliced and dried in commercial quantities, and several of those concerned in the matter determined to extract the sugar on the spot; accordingly, more than one attempt was made to carry out the slicing, and every difficulty was, apparently, overcome when the building erected for the plant was, unfortunately, burned. One of the principal difficulties hitherto had been that of drying the sliced cane; to avoid this, in 1845, Messrs. Constable and Michel introduced their method on the estate of Ste. Marie, the property of Major Beauscarin, in Guadaloupe. It was as follows:—The canes, which were sliced at the rate of one ton in 20 minutes, fell into metallic baskets capable of holding each that amount. The baskets were moved by a central crane, and around the crane, at equal distances, were placed 6 copper vessels adjusted to receive the baskets when filled. These copper vessels were filled to such an extent with water that when the basket, full of sliced canes, was lowered into any one, the liquid rose to the surface. The basket No. 1, with its contents, having been thus dipped into vessel No. 1, was allowed to remain immersed till such time as the sliced canes had parted by displacement with a due proportion of their sugar to the water in vessel No. 1; basket No. 1 was then hoisted out by the crane and consigned to vessel No. 2, where a second proportion of sugar was displaced, and so on throughout the series. In the meantime a fresh basket, full of sliced cane, was consigned to No. 1 vessel, the liquid in which abstracted a further proportion of sugar, and so on, till the contents of the first vessel were as fully saturated with sugar as the law of displacement allowed, and the slices of cane in the first basket were proportionately exhausted. This was virtually the old system of Dubunfaut with its defects, viz.: that the water was not easily kept at a suitable temperature; that the whole sugar was not extracted; and that, from the time which elapsed between slicing and exhaustion, considerable changes occurred in the saccharine fluid, which affected the quantity and quality of the result. These defects, in principle, did not, however, of themselves, contribute much to the failure of the plan; the system broke down in the subsequent evaporation, in which the heat employed was generated entirely from gas manufactured on the spot—an operation attended with such difficulties that the trials were given up after heavy outlay. This was much to be regretted, as the slicing process had shown that a much larger proportion of the sweets could be extracted from the cane than had been hitherto done in any other mode, for even the five-roller mills which had been started with sanguine hopes, during the preceding two years, had been successively abandoned. A system so simple and yet promising such complete results was not destined to disappear without traces. In September, 1847, Mr. Davier, apothecary in chief to the

French service at Basseterre, resumed the experiments of slicing and drying the canes, at the point where they had been left off in 1845. He found that by driving off about 33 per cent. of moisture from sliced canes, they became so friable as to be reduced, without difficulty, to a coarse powder, in which the colouring matter and supposed albumenoid principles of the cane had become insoluble in water, while the saccharine elements were crystallised unchanged and ready for immediate solution and extraction by water, either hot or cold; the former would have been the more rapid, but he had met with an objection to its use, which, if not scientific, was at least practical. The vessels he employed were of copper, and transmitted the heat so rapidly, that the attendants were constantly burning their fingers; he did not consider it worth while to take any precautions to avoid this evil, as he found cold water sufficient for the purpose and more economical. The process he adopted was the following:—Six upright cylinders of copper, about four feet high and nine inches in diameter, were so arranged as to communicate with each other, and with a reservoir of water on a higher level; they were each furnished with guages and stop-cocks; five of these were filled with cane powder, and the last with animal charcoal—this last was merely precautionary, but not essential to the work. Water was admitted into No. 1, and retained there for 20 minutes after the guage showed that the vessel was full; it was then passed into No. 2, and so on. In practice it was found that on escaping from No. 4 the water had absorbed so much sugar as to mark 22° of Beaume, or about the density when syrup is usually consigned to the vacuum pan, and that the cane powder first in contact with the water, viz., that in No. 1, was completely exhausted, even to the tongue, that most convenient and reliable saccharometer, and represented what it was reduced to in reality—a mass of wet sawdust. At this stage of the process it was removed from No. 1 and replaced by a fresh portion of cane powder. As this part of the operation was performed without interrupting the duties of the other cylinders, it is clear that two of the greatest desiderata in the application of science to art had been attained, namely, the complete extraction of the sugar in a state of purity, and that by a continuous operation. The mechanism thus employed by Mr. Davier in September, 1847, appeared to leave little room for improvement. It was submitted to and approved of by the French Government, who commissioned the inventor to repair to Paris in the ensuing month of March to take the necessary steps for erecting a set of machinery on a larger scale on the French King's Estate of Tremoullant, in Martinique. Fortune seemed thus about to crown Davier's laborious and successful trials; but, like the course of true love, his expectations were doomed to disappointment. Before his appointed hour of embarkation arrived, cries of *Vive la République* were ringing throughout the French islands, and the new process with, no doubt, many a kindred scheme, was shelved for the time. Since that I have several times, in conjunction with Mr. H. Warner, repeated the process of slicing and drying the sugar-cane, with exactly similar results, namely: the extraction of all the contained sugar by displacement with cold water, in about one hour and twenty minutes, in the form of a pure syrup, marking between 22° and 23° Beaume. Within the last three years Mr. Warner directed his attention again to the slicing of the cane, to ascertain how far he could succeed in extracting the sugar without recourse to drying the slices. After repeated trials, conducted with every precaution, he succeeded in obtaining, by displacement, a liquor marking 9° of Beaume where the original juice of the cane marked 10° Beaume; this was a great success, but not equal in results to the other mode where the slices were dried, because there was not only an original loss in not obtaining the whole sugar, but the juice had an opportunity of becoming changed to an extent that greatly increased the quantity of glucose. This latter evil may now be obviated by the use of the

bisulphide of lime, with which the displacing water might be slightly dosed so as to allow the antifermen to preserve the juice unchanged throughout the process of manufacture.

In conclusion, I may mention that the only difficulty which has at any time stood in the way of manufacturing sugar by the process of slicing, drying, and displacement—apart from the mechanical one of slicing, was a rapid and economical mode of drying; this, I am happy to say, has been at length attained by the successful action of the megassiccator, which may be now constructed to dry economically and speedily any given weight of sliced cane. The above remarks have been principally directed towards obtaining from the cane a saccharine fluid as pure as possible. It is in this elementary step that the whole difficulty of manufacture lies; the mere evaporation and concentration may be effected in various ways; pure sugar and water is not easily destroyed even by the rudest manipulation; but common cane-juice, as it runs from the mill, will produce an inferior muscovado, except under the most careful and expensive treatment.

THE NEW HIGH SCHOOL AND LABORATORIES OF PARIS.

The provisions of the recent decrees, for the establishment of a practical high school and laboratories of study and research, already noticed in the *Journal*, are being carried into effect on a grand scale, and the demands for admission exceed all expectation. As regards the school, there are already more than one hundred and fifty applications, viz.:—Fifteen for the section of mathematics; fifty-one for that of physics and chemistry; forty-seven for natural history and physiology; and forty-four for the section of history and philology. Amongst the candidates inscribed are several young men who have taken the degree of *agrégé*, or doctor, and others who quit the career already entered upon for the new school; many of the applicants are foreigners. The studies will commence in all the four sections at the usual scholastic period, namely, the middle of November. Some of the laboratories will be opened about the same time. At the Sorbonne, the laboratories of physics, botany, physiology, and geology, to which MM. Desains, Duchartre, Claude Bernard, and Hebert have been appointed, will shortly be ready, and a large chemical laboratory, over which MM. Pasteur and Sainte Claire Deville will preside, is now being erected by the side of the physical laboratory built last year and directed by M. Jamin. At the College of France, and at the Ecole Normale the chemical laboratories of MM. Balard and Berthelot will be ready in good time; and those of M. Claude Bernard for physiology, and M. Pasteur for physiological chemistry, somewhat later. At the museum of the Jardin des Plantes, the laboratories of Milne Edwards, for zoology, and of M. Decaisne for vegetable culture and physiology, are ready. New and larger establishments are being arranged for botany, chemistry, and comparative physiology.

The provinces express the desire that their laboratories should be considered as annexes of the new school; several towns propose to develop their means of superior education; and the Conseil-Général of Calvados has taken the lead by voting a grant of money in aid of the study of agricultural chemistry in the laboratory of research, instituted at the Faculty of Sciences of Caen.

The council of the new high school is convened for the third of November, and the following are the names of the members appointed, in addition to those mentioned in a former notice, who have seats in the council on account of their official positions:—In the section of mathematics MM. Bertrand, Chasles, Delaunay, and Serret, members of the Institute of France; M. Puiseux, professor in the Faculty of Sciences of Paris. Section of physics and chemistry, MM. Balard, Frémy, and Wurtz, members of the Institute; MM. Desain and

Jamin, professors in the Faculty of Sciences. Natural sciences: MM. Claude Bernard, Brongniart, Decaisne and Milne Edwards, members of the institute, M. Hébert, professor in the Faculty of Sciences. Historic and philological sciences: MM. Maury, L. Rénier, de Rougé, and Waddington, members of the Institute, M. Béal, professor in the College of France.

The list of the laboratories given above shows the extent to which this new system of superior scientific education is to be carried, and the names of the professors and members of the governing council afford a guarantee of the quality of the instruction to be afforded. The scheme is certainly the most important and the most extensive of all those which have yet been put forward for the dissemination of high scientific knowledge.

HAVRE EXHIBITION.

The distribution of the awards made by the jury at this exhibition was announced to take place on the 25th of the present month of October, but the date has been altered to Monday the 26th, in deference to English views respecting Sunday. The ceremony will be presided over by M. Forcade de la Roquette, Minister of Agriculture, Commerce, and Public Works. The minister and M. Nicolle, the director of the exhibition, will deliver addresses. In the evening a grand banquet will be given in honour of the minister, in the Cercle International in the exhibition garden. This building was admirably adapted for the purpose for which it was erected, namely, a club-house, but it has never been used as such, and supplies fresh evidence, if that were needed, of the futility of such establishments in connection with industrial exhibitions. The principal use to which the cercle was put was for the exhibition of flowers, and more than one admirable collection was to be seen within its walls. A few conferences were also given there on various subjects. Concerts were attempted, but without success. Although club-houses are failures in such cases, it is highly convenient for exhibitors, members of the press, and others to have the means of writing letters, reading newspapers, making notes, &c., and the managers of the Havre exhibition provided this accommodation, to a certain extent, without charge. On an upper floor in the fine art gallery, in connection with a good exhibition of drawings and models, was a library, the main object of which was to exhibit books, memoirs, maps, and charts interesting to the commercial world, under the charge of a gentleman well-informed on such subjects, and this room was freely open to all who applied for admission. This is a precedent which may well be followed on future occasions.

Warnings are sometimes almost as valuable as examples, and this, like all other exhibitions, supplies both; a striking instance of the former is furnished in the arrangement of the fine art portion of the exhibition. The gallery set apart for the fine arts was found, long before the opening of the exhibition, to be much too small for the purpose; this was devoted to old pictures and objects of art, and a special gallery was erected for modern pictures in the rear of the chief building, but separated from it by a road, so that the collection is extensive and good, but the gallery has presented a deserted aspect throughout the whole time of the exhibition. It was proposed to separate the industrial and fine art exhibitions in Paris last year, but the proposal was fortunately overruled, and all the world knows what masses of visitors were constantly to be found in the picture galleries of the Champ de Mars, and how the connection of the two tended to diminish crowding in either the one or the other. Those who visited the Paris Exhibition of 1855, when the two portions were in separate buildings, will remember the overcrowded state of the industrial classes in the Palais de l'Industrie, and the generally-deserted condition of the fine collection of works of art across the road.

Fine Arts.

CONGRESS FOR THE DISCUSSION OF THE METHODS OF TEACHING DRAWING, &c.—This congress has brought its labours to a close. One of the important questions discussed at the last meeting was the following:—"In the organization of fine art academies, that is to say, in special schools for complete instruction in the arts of design, is it proper to include, with a view to the wants of industry, a method of teaching applied art differing in any way from that which is requisite for art properly so called? What should be the programme for such instruction? And, if some portions of this double education are common to both methods, where should the separation commence?" The whole of the speakers pronounced in favour of the unity of art, all declaring that there was no real distinction between teaching applied art and artistic education properly so called. Amongst the most prominent speakers were M. Klein, of Copenhagen, M. Louvrier de Lajolais, of Paris, and M. Jean Rousseau, secretary of the Belgian commission of public monuments; the last-named gentleman claimed the assistance and influence of great artists in the interest of industrial art, to which he attached great importance, and expressed his opinion that its teaching should form a portion of superior artistic education. The almost unanimous feeling of the meeting on the above important question is the more striking from the fact that it is opposed to the methods which are adopted in industrial art education in France, England, and most other countries. Amongst the other subjects discussed was the importance of local museums and galleries of models; and the system of ambulatory collections adopted by the South Kensington Museum was specially referred to and highly eulogised. Another recommendation was unanimously adopted by the congress, namely, that of the establishment of general and local competitions amongst pupils. M. Joseph Gérard sketched the plan of such meetings, or rather of their principles, in the following terms—"Absolute liberty as to methods adopted. No intervention of the government as regards theory, but only with respect to recompenses proportioned to the results achieved."

Commerce.

PROPOSED DÉPÔT FOR FRENCH FABRICS.—The *Daily Telegraph* says:—"M. Vidal, a French resident at Manchester, and a member of the Chamber of Commerce in that city, is, it appears, taking steps to establish an association there for the sale of French fabrics suitable for export. He has opened communications with the manufacturers of Alsace, Amiens, and other places; and he proposes to form in the cotton metropolis of England a dépôt where the principal textures, cotton, woollen, and mixed, that are produced by our neighbours across the Channel, may be constantly on sale for the use of shippers, as well as buyers in our home market. The idea is novel and bold. We all know that French stuffs for dresses are not less regularly and freely bought by English people in English shops, than French gloves, jewelry, or bronzes. But the export trade, for which Manchester is the great mart, is a branch of commerce which we have managed to keep, on the whole, pretty much in our own hands. It has been profitable—of that there is no doubt; and M. Vidal, knowing what the taste and skill of his countrymen have accomplished elsewhere, fairly enough reasons that there need be no insuperable obstacle to their obtaining a share in the pleasant duty of supplying India and China with prints and shirtings. To do so, however, they must meet the demand where it arises—if the buyers don't go to France, France must go to the buyers. Hence the idea of a great central dépôt at Manchester. Well, what have we to say against this? Are we jealous and

uneasy? Not at all; and for several sufficient reasons. If our neighbours carry out their plan, the result will be that Manchester will become, not merely a producing centre, but an *entrepôt* in a wider sense than at present, attracting business in addition to that which it possesses now. Further, we have long outgrown all fears of danger to home interests from the greater cheapness of foreign productions; and Englishmen will certainly buy M. Vidal's goods, if they are cheaper and better than our own, in the full conviction that we shall thus act for our own advantage as consumers. We know also that, in such a case, our manufacturers, who are quite competent to take their own part, will be no losers in the long run, but will only be stimulated by the new competition into greater efforts to please all their customers, domestic and foreign. Finally, we welcome M. Vidal's effort, for the plain reason that, if successful, it will put a stop to all irrational clamour against the French Treaty of 1860. If French manufacturers can thus beard English industry on its own ground, what becomes of the complaint so freely uttered by M. Pouyer-Quertier and others a few months ago, that these very makers were threatened with ruin from inability to compete with the products of Lancashire?"

BEET-ROOT SUGAR.—The following are Herr Burger's estimates of the beet crops:—

	1868-9.	1867-8.	1866-7.	1865-6.
	Tons.	Tons.	Tons.	Tons.
France	200,000	224,767	216,855	274,014
North Germany	200,000	165,000	201,012	185,701
Russia	90,000	120,000	100,000	75,000
Austria	80,000	95,000	100,000	80,000
Belgium	35,000	31,093	39,133	41,552
Poland	17,500	15,000	19,000	17,500
Holland and } Sweden	8,500	8,000	6,500	5,433
Total	631,000	658,860	682,500	679,200

We are aware (says the *Produce Markets Review*), that the estimate of 200,000 tons for France is the one accepted by the best authorities, but at the same time we are inclined to think that more weight should be attached to the undoubtedly increase in the area cultivated, and that the figure fixed upon gives the worst view of the case. Be this as it may, it is certain the estimated total for 1868-69 shows a wonderful increase on the crop of four years back. The yield for 1864-65 is given by Herr Burger as 552,000 tons; for 1863-64, 417,800; 1862-63, 474,150 tons; 1861-62, 426,700 tons; and 1860-61, 386,880 tons.

Colonies.

MINERAL STATISTICS OF VICTORIA.

The following is from the *Australian and New Zealand Gazette*, of September 19:—

The mineral statistics of the colony of Victoria, for the year 1867, which confer great credit on the Executive department, contain some very interesting information with respect to this important branch of colonial enterprise. It is premised that "whilst the old centres of population are still prosperous the miners continue to explore, with scarcely diminished energy, the more remote parts of the colony, many of which are now the scenes of active industry. The gold fields now extend westward from Stawell to the river Bendoc, on the eastern confines of the colony, a distance of 350 miles, and from north to south nearly 180 miles. It is not easy to collect accurate information respecting the proceedings of the miners over so large an area; and but for the zeal and activity of the several officers employed in the department, and the prompt, courteous replies

made to inquiries by mine-owners and others, these tables could not have been compiled."

The decrease in the number of miners employed which has been observed from year to year since 1859, though not so large this year as last, if we compare the mean numbers for the two years, is yet so great as to occasion surprise. The mean number of miners employed in 1866, was 73,577; and in 1867, it was 65,857; showing a decrease of 7,720. In none of the districts is there an increase in the number of alluvial miners; and in the mining districts of Maryborough and Castlemaine the decrease is very large. As regards Maryborough, this is mainly due to the fact that large numbers of the Chinese miners have left the central division and to a considerable reduction of the number of European miners in the Dunolly division. In the central division of the Castlemaine district there is a decrease of 620 in the number of Chinese alluvial miners; and in the other large divisions the decrease in the number of both Europeans and Chinese alluvial miners is considerable. The operations of the 42nd section of the Amending Land Act and the prosecution on an extensive scale of public works for the supply of water to Geelong and the gold fields have had the effect of withdrawing great numbers from mining pursuits. Those who have a desire to acquire landed property and those who can apply only unskilled labour in mining operations are glad to have an opportunity of leaving a somewhat uncertain but, in the main, profitable pursuit for employments better suited to their tastes and capacities.

In 1866 there was a decrease in the number of quartz miners, as compared with 1865, of 2,448, and it is a hopeful sign that this year it is so much smaller, and that in the two districts—Ballarat and Beechworth—where the decrease was so remarkable in 1866, there is this year in both a small increase. The following shows the total number of miners employed on the gold fields from 1859 to 1867 inclusive:

1859 ..	125,764	1862 ..	93,379	1865 ..	79,457
1860 ..	108,562	1863 ..	92,994	1866 ..	70,794
1861 ..	100,463	1864 ..	84,986	1867 ..	63,053.

That the total number of miners in 1867 should be little more than half of the number for 1859, is, at the first view, somewhat perplexing and seemingly irreconcileable with that appearance of prosperity which is observable in nearly every part of the colony; yet, when taken in connection with other statistics—those relating to roads, public works, municipalities, agriculture, and stock—it is even more surprising that so much should have been done for the permanent improvement of the towns, in the construction of railways and roads, and in reclaiming waste lands, and that still more than 60,000 persons, among a population of 660,000, should continue to give all their labour to the work of searching for gold.

On the 31st December, 1867, there were 15,629 Chinese miners engaged in alluvial mining and 47 in quartz mining, making a total of 15,676. Having regard to the extent of the auriferous areas, they are not very unequally distributed throughout the mining districts, except as regards Gipps' Land, where there are only 640 enumerated. It is probable, however, that in this district a good many not included in the registrars' returns are employed near the boundary line between Victoria and New South Wales. Last year the number was 20,134, showing a decrease of 4,458. Several causes have operated to reduce the number of those employed in mining. A great many have found employment in New Zealand, not a few have returned to China, and large numbers have found it profitable to devote their labours to gardening in places where there is a ready market for their produce. It is, perhaps, not more difficult now than formerly for them to get good profits by re-working abandoned auriferous ground; and enjoying in every respect the same privileges as Europeans, it is somewhat remarkable that the numbers continue to decrease.

The following is a statement of the average earnings per man per annum for the past eight years, without distinction of classes:—

1860 ..	£79	9	3	1864 ..	£74	1	9
1861 ..	74	15	11	1865 ..	74	4	2
1862 ..	67	17	10	1866 ..	80	8	3
1863 ..	70	9	2	1867 ..	87	1	7

The mean for the eight years is £76 1s. nearly. The average earnings per man of the alluvial miners and quartz miners severally, in 1867, was—alluvial miners, £67 10s. 7½d.; quartz miners, £158 11s. 8½d. These calculations must not be accepted as absolutely correct, though every endeavour has been made to get accurate data. With respect to the earnings of the quartz miners the difficulty is not so great, because there is some check on the estimated quantity of gold got in the quantities of gold actually obtained from certain parcels of quartz crushed. The average earnings of the quartz miner would amount to £141 1s. 9½d. from the data so obtained, but it is well known that it is at present impossible to get returns from all the mills. It is satisfactory to note that in whatever way the matter is tested, this fact is indisputable—that both from the alluvial mines and the quartz veins the average returns per man per annum are higher this year than they have been at any time during the past eight years.

The number of engines employed remains nearly as it was last year (1866); but many small additions to apparatus, which it is not possible to comprise in a return, have been made in several of the larger establishments, and with good results.

The number of steam-engines employed and the stamp-heads for reducing vein-stuff, for the past four years, are as follows:—

Year.	Alluvial. No.	Quartz. No.	No. of stampheads.
1864	441	447	4,575
1865	473	491	5,119
1866	480	510	5,437
1867	470	532	5,529

There is a slight decrease in the power employed in alluvial mining, but in quartz mining the increase is marked and satisfactory. According to the returns made by the mining registrars and surveyors, there are 2,381 auriferous quartz reefs already opened, and 868½ square miles of auriferous ground which have been worked, more or less.

The total area of land held as "claims" under the bye-laws of the Mining Boards was, on the 31st of December, 1867, as follows:—

	Acre.
Ballarat	20,877
Beechworth	25,834
Sandhurst	4,129
Maryborough	4,672
Castlemaine	6,066
Ararat	7,038
Gipps' Land	7,060

Total

75,677

Excluding the land protected by certificates (which may or may not be worked hereafter), there were, therefore, only 73,918a. 1r. 35p. actually held *bond fide* for mining purposes on the 31st December by 63,053 miners, giving an average per man of 1a. 0r. 27p. The number of leases in force on the 31st December, 1867, was 1,047; area, 11,846 acres. The total amount of capital proposed to be employed in working these areas was £3,194,281. The revenue derived from the gold-fields from 1851 to 1867 inclusive is £5,179,445 0s. 9d. The revenue derived during 1867 from lands held by virtue of miners' rights, under the bye-laws of the mining boards, was £11,567 18s. 9d., and taking the mean total area so held for the

past year, the miners have paid at the rate of 3s. 0*4*7d. per acre; and, under the leasing system, the amount actually paid per acre is 15s. 4d. The estimated value of the "claims" in all the districts of the colony is £7,461,212. 948,850 12-20ths tons of quartz were crushed during the year 1867, which yielded 498,677 ozs. of gold, or an average of 10 dwts. 12*2* grs. per ton.

An interesting question, engaging a large share of public attention, is the extraction of gold from auriferous pyrites. In the Creswick division 165 tons of pyrites yielded 751 ozs. 8 dwts. of gold, or an average of 4 ozs. 11 dwts. 1*8*9 grs. per ton. In the Crooked River subdivision 2 tons gave 94 ozs. 14 dwts., or at the rate of 47 ozs. 7 dwts. per ton. From the Blackwood division a number of samples have been sent to Melbourne, and the yield is said to be from £17 to £32 per ton. The average return of gold is, therefore, about three ounces per ton, and the cost of extracting the gold £3 per ton, or £1 per ounce.

The length of water races is 2,300 miles 24 chains. These are used exclusively for mining purposes, and have cost, according to the information furnished by the registrars, £321,903, or at the rate of £139 18s. 8d. per mile. On the 31st December, 1867, there were 126 water-right licenses in force. The areas occupied amount in the aggregate to 1,194 a. 2 r. 23 p.; the total length of the races is 300 miles 13 52-100th chains, and the maximum quantity of water to be diverted per diem is 131,990,000 gallons. The aggregate area of the reservoirs under license is 303a. 2r. 17p., and the total capacity of the same 232,102,092 gallons. The capital invested, or proposed to be invested, in these works is £138,257, and the annual rent paid is £989 10s.

The mining companies registered in the several courts of mines during the past year amounted to 190, the number of shares, 491,804, and the nominal capital £1,234,096 10s. The number of companies wound up during the year was 12, the number of shares comprised in them was 16,680, and the nominal capital was £131,600.

The following is the account of the metals and minerals other than gold obtained during the year:—

Silver.—Only 178 tons of ores were raised at St. Arnaud, and but 78 ozs. 12 dwts. of silver smelted; but a large quantity of the gold got was mixed with silver, and it is not known how much was parted in Victoria. The customs returns show that 366 ozs. 2 dwts. of silver were exported.

Tin.—There were 177 tons 10 cwt. of black sand (mostly oxide of tin) and 4,256 lbs. of tin exported during the year.

Copper.—About 230 tons of ores have been raised, and 3 cwt. of copper exported.

Antimony.—There were 272 tons of sulphide of antimony raised, and 508 tons 7 cwt. exported. This last includes ores which were raised but not sent forward for export during 1866.

Coal and lignites.—Only a few samples were raised.

Flags and Slates.—There were 1,560 square yards of hearth-stones; 2,000 square yards of coreing; 6,440 square yards of paving; and 431 tons 15*1*2 cwt. of flags raised during the year. The quarries containing roofing slates were not worked.

The following is an estimate of the value of the metals and minerals raised in the colony from the first discovery of the gold fields to the 31st December, 1867:—

Gold, 33,910,052 <i>3</i> ozs.	£135,643,811
Silver, 12,591 ozs. 18 dwts. at 5s. 6d.	
per oz.	3,460
Tin 195,045	
Copper 4,673	
Antimony 30,426	
Coal, 1,933 tons, at £1 10s. per ton	2,899
Lignite, 235 tons, at 17s. 6d. per ton	205
Kaolin, 1,757 tons, at £4 per ton..	7,028
Flagging 18,663	

Slates	508
Magnesite, 6 <i>1</i> ₄ tons, at £2 per ton..	12
Diamonds, about 80 carats, at an ..	
average of, say, £1 per carat ..	80
Sapphires, numbers cannot be esti- mated—say	150
Total	£145,006,692

The quantity of gold exported during 1867 was 1,433,687 ozs., of which 560,527 ozs. were obtained from quartz veins, and 873,160 ozs. from alluvial workings.

Notes.

REGULATIONS OF THE FRENCH TELEGRAPHIC SERVICE.

—The annual examination of candidates for admission as supernumerary or probationary clerks in the telegraph service, is appointed to take place in the month of November, in the chief town of each department of the empire. Each candidate is required, in the first place, to deposit at the *mairie* certificates of birth, of having complied with the regulations of the conscription, of character, diploma of any college degree that he may have obtained, and to indicate the place in which he desires to be employed. The candidate must be not less than eighteen or more than twenty-eight years of age, except in the case of those who have passed seven full years in military service, or as teachers. The following are the heads of the programme of examination:—Writing, spelling, and French composition; the four rules of arithmetic, fractions, decimals, and the metrical system; natural philosophy and chemistry, the elements of electricity, and the action of batteries; geography. Very good writing and perfect orthography are absolutely insisted on; failing in these the candidates are immediately rejected. Those who desire it are also examined in one or more of the following languages:—German, English, Spanish, Italian, Dutch, Portuguese, and Arab. The candidates are also required to undergo examination by a medical man. At the expiration of the probationary stage, the duration of which is not stated, the supernumeraries are required to undergo another examination, when, if their theoretical and practical instruction are found to be satisfactory, they are placed permanently on the establishment.

POPULATION OF AUSTRIA.—A statistical work just published in Austria gives in the following proportions the nationality of the population of that empire:—8,782,000 German; 6,521,400 Czechs, Moravians, and Slaves; 2,380,000 Poles; 2,985,000 Ruthenians; 1,203,600 Slovens; 5,400,800 Magyars; 2,916,000 Croatians or Servians; 2,884,000 Roumanians; 1,121,000 Jews; 589,100 Italians; 152,800 Zingari; 53,800 Bulgarians, Armenians, Greeks, &c. This country contains 26,600,000 Catholics, 3,100,000 Greeks, 2,400,000 Protestants, and about half a million of Jews; the remainder consists of Armenians, Unitarians, Mahometans, and members of various other creeds. The soil of Austria produces yearly, on an average, 518 millions of bushels of grain of all kinds, 203 millions of bushels of potatoes, two millions of tons of beetroot, and 240 millions of gallons of wine.

Correspondence.

FARM WAGES.—SIR,—With respect to this subject, the following account of yearly wages in the year 1732 appointed by the justices for the respective counties of Kent and Gloucester, may be interesting and useful for comparison. For Kent, wages were not to exceed the sums following:—

	£	s.	d.
Head ploughman, waggoner, or seedsman	8	0	0
His mate	4	0	0

Best woman-servant.....	3	0	0	Pistons, &c., packing for—2814—E. Turner.
Second sort.....	2	0	0	Plants, &c., withering the leaves and flowers of—2894—B. Dickinson.
Second ploughman.....	6	0	0	Potatoes, preserving, &c.—2941—J. Torbitt.
His mate	3	0	0	Printing presses, &c., blankets for—3055—J. H. Johnson.
Labourers by day in summer	0	1	2	Railway breaks, &c.—3041—E. Simons.
" in winter	0	1	0	Railway fastenings—2789—A. B. Ibbotson.
For Gloucestershire, wages were not to exceed the following sums:—				Railway tickets, &c., perforating—2741—J. Sloper.
Head-servant in husbandry.....	5	0	0	Rifled barrels—2912—W. J. Murphy and J. B. O'Hea.
Second servant	4	0	0	Rifling machines—2892—G. Innes.
Driving-boy, under 14 years'	1	0	0	Saw handles—3079—J. H. Johnson.
Head maid-servant in dairy and cook....	2	10	0	Sawing machines—3049—H. Steffanson.
Second maid-servant.....	2	0	0	Scissors sharpener—2997—W. E. Newton.
Mower in harvest-time, without drink, per day	0	1	2	Sewage, &c., treating—2919—E. H. Prentice.
With drink	0	1	0	Sewing machines—2922—H. Lomax.
Mower and reaper in corn-harvest, with diet, per day	0	1	0	Ships, &c., propelling—3001—J. Woollatt and W. B. Dodds.
Other day labourer, from corn to hay-harvest, with drink only, per day	0	0	8	Slieves—3065—J. Dupree.
With diet, per day.....	0	0	4	Skates—3027—T. C. Parson, jun.
Without diet or drink, per day	0	0	10	Steam engines—3019—G. H. Croft and W. N. Dack.
Carpenter, wheelwright, and mason, without drink, per day	0	1	2	Steam engines, &c.—2787—W. McNaught.
With drink, per day	0	1	0	Steam engines, &c.—2866—H. Wilson.

At that time (May) hay sold in London at £3 5s. per oad; coals, 22s. per chaldron to 25s.; wheat, 22s. to 26s. per quarter; oats, 10s. to 13s. 6d. per quarter; barley, 13s. to 17s. 6d. per quarter.—I am, &c., CHR. COOKE, Mem. Soc. Arts.

London, 15th October, 1868.

Patents.

From Commissioners of Patents' Journal, October 16.

GRANTS OF PROVISIONAL PROTECTION.

Axle boxes—2911—W. L. Wise.
Boats, paper—3083—G. Davies.
Boilers—2332—W. E. Gedge.
Boilers, &c., preventing the escape of heat from the surfaces of—3035—J. Howden.
Bone black, reviving—3031—J. Rogers.
Bricks, fire, and fire-resisting cement—3059—R. T. Monteith.
Buildings, &c., disinfecting—3067—W. Estor and C. T. Pearce.
Carding machines, &c., feeding wool, &c., to—2872—W. Clissold.
Cards, apparatus for shuffling and dealing—1896—H. A. Bonneville.
Carriage-door steps—2876—W. Cross.
Cartridges—2900—W. E. Wiley.
Cloth, felted—3073—J. Barcroft.
Copper, separating from its solutions—2805—G. Bischof, jun.
Dyeing apparatus—2945—P. Kean.
Fabrics, apparatus for producing adjustable pressure on rollers used in manufacturing—3057—W. Sievwright, jun., and G. Worrall.
Fibrous materials, extracting liquids from—2890—J. Brown.
Fibrous materials, preparing, &c.—2844—G. Bernhardt.
Fire-arms, repeating—3039—C. F. Galand and A. Sommerville.
Fire-escape, &c., apparatus to be used as a—2760—F. Andoe.
Furnaces—2868—T. and J. Jones, J. Brandwood, and J. Wren.
Furnaces—3017—W. R. Lake.
Games played with balls and cues—3075—E. J. Hughes.
Gas, lighting and regulating the flow of—2898—J. H. Johnson.
Hop poles, fixing and drawing—3085—R. Winder.
Horses' blinkers—2604—E. J. E. Niepce, jun.
Horses, &c., apparatus for clipping—2999—G. A. F. E. Dalrymple.
Infants, &c., supplying nourishment to—3021—E. O'Connell.
Knitting machinery—3063—W. E. Newton.
Lace—3025—S. Bates and W. Redgate.
Lamps and lanterns—2979—J. H. Irwin.
Leather-dressing machinery—2889—W. Haynes.
Leather, graining and bruising—2896—H. Foster.
Lighthouses, illuminating—3043—J. R. Wigham.
Looms—3003—B. W. Stevens.
Looms—3011—D. Crichton, W. Donbavand, and D. Crichton.
Malt, roasted, obtaining extracts from—3081—J. Steel.
Manure, making and preserving—3087—J. Dewar.
Manure, manufacture of—3033—B. E. R. Newlands.
Measures for measuring liquids—2914—B. C. Scott.
Meat-mincing machines—2817—J. Coppard.
Mowing and reaping machines—3023—N. Henwood.
Needles, packing up—3029—Z. Shrimpton.
Oil-cake, envelopes used in making—3053—C. Eskrett.
Paper, sizing—2821—C. E. Pommier.
Paper, &c., applying adhesive agents to—3071—G. Speight.
Pianofortes, &c.—2836—J. H. Schucht.

Pistons, &c., packing for—2814—E. Turner.
Plants, &c., withering the leaves and flowers of—2894—B. Dickinson.
Potatoes, preserving, &c.—2941—J. Torbitt.
Printing presses, &c., blankets for—3055—J. H. Johnson.
Railway breaks, &c.—3041—E. Simons.
Railway fastenings—2789—A. B. Ibbotson.
Railway tickets, &c., perforating—2741—J. Sloper.
Rifled barrels—2912—W. J. Murphy and J. B. O'Hea.
Rifling machines—2892—G. Innes.
Saw handles—3079—J. H. Johnson.
Sawing machines—3049—H. Steffanson.
Scissors sharpener—2997—W. E. Newton.
Sewage, &c., treating—2919—E. H. Prentice.
Sewing machines—2922—H. Lomax.
Ships, &c., propelling—3001—J. Woollatt and W. B. Dodds.
Slieves—3065—J. Dupree.
Skates—3027—T. C. Parson, jun.
Steam engines—3019—G. H. Croft and W. N. Dack.
Steam engines, &c.—2787—W. McNaught.
Steam engines, &c.—2866—H. Wilson.
Steam engines, &c., governors for—2615—W. J. & C. A. Kesselmeyer.
Steam engines, &c., valves of—3037—J. B. Joyce.
Street-lamp reflectors—2888—M. Macdermott.
Taps—2902—C. Wheeler.
Telegraph posts, metallic—2735—S. Sharrock.
Telegraphic instruments—2916—R. Harling.
Tobacco, twisted—3013—R. Legg.
Umbrellas, &c.—2908—S. Fox.
Vehicles, &c., registering distance traversed by—2606—P. N. Hasluck.
Warping machines—3061—W. Rossetter.
Washing or bleaching apparatus—2837—W. Campion and G. Hall.
Watch-case spring—2981—A. H. Brandon.
Wool, &c., preparing—2995—W. Richardson.
Yarns, &c., dyeing and printing—2918—F. C. Calvert.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Electro-plating with nickel—3117—W. R. Lake.

From Commissioners of Patents' Journal, October 20.

PATENTS SEALED.

1252. H. G. Fairburn.	1342. T. T. Macneill.
1253. C. W. Siemens.	1344. J. R. Johnson.
1255. H. O. Robinson.	1345. R. and T. Nuttall and B. Barber.
1256. W. Gorman.	1347. C. W. Harrison.
1259. W. E. Gedge.	1348. J. Liddard and G. Buxton.
1260. F. Bacon.	1353. W. Bartram.
1264. T. Bradford.	1354. G. A. Welch.
1265. G. Lister.	1361. P. Spence.
1266. E. T. Hughes.	1362. A. W. Pocock.
1271. N. Agar.	1370. E. P. H. Vaughan.
1272. H. W. Widmark.	1371. J. Hepworth and G. W. Bayldon.
1274. R. Hill and J. F. D'Oyly.	1375. P. Nisser.
1275. A. B. Childs.	1376. K. V. Barnekov.
1279. J. Cooke.	1377. H. Chaytor.
1281. J. and J. A. Fawcett.	1378. R. Hoy, R. Burlison, and H. Sampson.
1284. J. McGhie.	1379. L. Perkins.
1285. S. W. Worssam, jun.	1380. J. Scoffern.
1286. W. W. Symington.	1381. L. Perkins.
1287. J. R. Humes and J. G. Sullivan.	1393. G. B. Babacci.
1290. J. Woolfield.	1407. A. Homfray.
1294. E. Kemp and H. Gourlay.	1424. C. D. Abel.
1295. A. Paget.	1430. P. Marlin and A. Tack.
1297. L. Bing.	1454. T. and G. A. Pemberton.
1298. S. Dreyfous.	1481. J. Young.
1302. M. S. Maynard & R. Grime.	1513. C. E. Brooman.
1306. J. H. Bolton.	1515. W. Seck.
1308. T. Whittaker.	1538. J. B. Kingham.
1310. R. Side.	1539. A. Holbrook, jun.
1312. T. L. Scowen.	1557. S. B. Allen.
1313. T. L. Scowen.	1568. W. E. Newton.
1317. H. Hill.	1568. A. V. Newton.
1320. H. H. Murdoch.	1778. P. Buchan.
1321. R. F. Fairlie.	1984. A. Mackie.
1323. E. Samson.	2448. A. V. Newton.
1326. E. Rostron and W. W. Whittaker.	2478. W. E. Newton.
1330. G. F. and J. Stidolph and T. Simpson.	2488. H. Dubs.
1332. J. Armstrong.	2545. J. B. Thompson.
1333. W. R. Lake.	2612. J. Tall.
1335. J. Reid.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2653. W. J. C. Macmillan, J. Mason, and J. V. Scarborough.	2661. F. Wise, E. Field, and E. H. Aydon.
2678. G. Davies.	2665. J., S. A., G. E., and F. F. Reading.
2752. W. M. Scott.	2674. C. G. Lenk.
2656. J. L. Hancock.	2709. J. and G. H. Needham.
2660. A. J. Mott.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2766. J. Archer.	2616. C. De Bergue.
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